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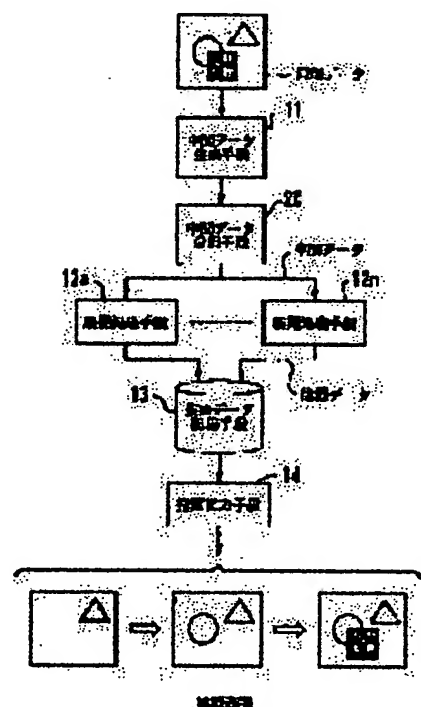
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## (54) PLOTTING PROCESSOR

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a plotting processor that can perform an efficient object plotting processing by preliminarily checking the overlapped area of intermediate data (object).

SOLUTION: An intermediate data generating means 11 generates intermediate data whose abstraction is higher than that of a data structure capable of plotting-output, which are expressed in a format including at least one kind of basic graphic from printing data. Development processing means 12a-12n develops the intermediate data into plotting data having a data structure capable of plotting and outputting. An intermediate data distributing means 20 judges whether or not the intermediate data have an area overlapped on undeveloped intermediate data, and distributes the intermediate data without any overlapped area to the development processing means 12a-12n based on a priority order. A plotting data storing means 13 stores the plotting data. A plotting output means 14 plotting-outputs the stored plotting data.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] In the drawing processor which has either an alphabetic character, a graphic form or an image at least, and performs drawing processing by considering the print data described with a drawing instruction as an input A medium data generation means to generate the medium data expressed in the format which whenever [ abstract ] is higher than the DS in which a drawing output is possible, and contains at least one kind of elementary figure from said print data, Two or more expansion processing means which carry out expansion processing at drawing data with the DS in which a drawing output of said medium data is possible, A medium data distribution means to distribute based on priority whether there is any field where said medium data lap with said medium data of processing in which it does not develop to said expansion processing means from said medium data which judge and do not have the field with which it laps, The drawing processor characterized by having a drawing data storage means to memorize said drawing data, and the drawing output means which carries out the drawing output of said memorized drawing data.

[Claim 2] Said medium data generation means is a drawing processor according to claim 1 characterized by generating said medium data from said print data described by the Page Description Language.

[Claim 3] a lap judging means judge whether said medium data distribution means has the fetch means which is the smallest unit of said medium data and which takes out said medium data from said medium data generation means for every object, an object buffer holding said object, and the field where said medium data lap with said medium data of processing in which it does not develop, and a priority decision means determine said priority -- since -- the drawing processor according to claim 1 characterized by to be constituted.

[Claim 4] If the coordinates of the circumscription rectangle of said two medium data are (x1, y1, x2, y2), and (X1, Y1, X2, Y2), said lap judging means It is the drawing processor according to claim 3 characterized by judging with said two medium data having lapped when filling  $x1 \leq X2$ ,  $y1 \leq Y2$ ,  $x2 \geq X1$ , and  $y2 \geq Y1$ .

[Claim 5] Said priority decision means is a drawing processor according to claim 3 characterized by setting up a priority highly, so that the time amount which there is no field where said medium data lap with said medium data of processing in which it does not develop, and is in a queue is long.

[Claim 6] Said expansion processing means is a drawing processor according to claim 1 characterized by reconfiguring the content of expansion processing of said expansion processing block according to the class of said medium data which two or more expansion processing blocks are consisted of, and are received.

[Claim 7] Said priority decision means is a drawing processor according to claim 6 characterized by giving priority to said object which can be processed from the same content of expansion processing as the content of expansion processing of said expansion processing block which the opening generated, and outputting to said expansion processing means.

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## **DETAILED DESCRIPTION**

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### **[Detailed Description of the Invention]**

**[0001]**

**[Field of the Invention]** This invention relates to the drawing processor which has either an alphabetic character, a graphic form or an image at least, and performs drawing processing especially by considering the print data described with a drawing instruction as an input in a drawing processor.

**[0002]**

**[Description of the Prior Art]** The printing processor using the description language which amplification of a graphic form, an alphabetic character, etc., a revolution, deformation, etc. can control freely from printing based on [ conventional ] text has been carrying out current spread with development of the page printer of an electrophotography method suitable for the digital printing of small and a high speed.

**[0003]** As an example of representation of this description language, PostScript (Adobe Systems shrine trademark), Interpress (Xerox shrine trademark), etc. are known. Since the drawing instruction expressing the image of the location of the arbitration in a page, a graphic form, and an alphabetic character is constituted in order of arbitration, the print data created with the description language must rasterize print data before printing.

**[0004]** Rasterization is processing which generates the scanning line which develops to each dots and pixels of a series of which cross a part of page or page, forms a raster scan line, and follows under the page one after another.

**[0005]** Moreover, in case another object on the already drawn object is drawn in the print data currently created with the description language, it is common that the object drawn later overwrites an old object.

**[0006]** The drawing model for which it depended in order of such drawing is called the opaque (opaque) model. In an opaque model, in case juxtaposition drawing of the object is carried out, when a lap occurs between the objects which are processing, it is necessary to output the raster processed in consideration of the drawing sequence of an object.

**[0007]** For this reason, it was difficult for one unsettled object to become the hindrance of an object [ finishing / other processings ], and to perform juxtaposition drawing of an object efficiently. In case it draws per object, the juxtaposition drawing technique using the dispatch table as the one technique of making parallel execution possible is proposed.

**[0008]** For example, in JP,5-266201,A, in order to process drawing of an object in two or more expansion processing sections, the dispatch table is used and managed. This will be registered into a dispatch table if the object to which application draws is published first. And the expansion processing section of a current processor limited acquires the object processed next with reference to a dispatch table.

**[0009]** Moreover, if application publishes the attribute change command of an object, since the object after this is influenced of this attribute change command, it needs to take a synchronization.

**[0010]** For this reason, after checking that all the expansion processing sections under current processing have become a processor limited, an attribute change command is executed. Thus, the load distribution was performed in two or more expansion processing sections, and juxtaposition drawing is realized.

[0011]

[Problem(s) to be Solved by the Invention] However, with the above conventional techniques, the lap field between objects is not taken into consideration at all. Therefore, when it applied to drawing using an opaque model, and two or more expansion processing sections shared processing of an object and a processing result was compounded, there was a problem that the up Shimonoseki charge of an object might be mistaken.

[0012] Moreover, although up Shimonoseki charge of an object was not mistaken when each expansion processing section wrote a processing result in the storage section sequentially, there was a problem of becoming a bottleneck when performing parallel processing in this case.

[0013] Furthermore, in order that each expansion processing section might hold a processing result to a buffer temporarily, the storage region was needed to each expansion processing section, and there was a problem of leading to buildup of circuit magnitude.

[0014] This invention is made in view of such a point, the lap field of each object is investigated beforehand, and it aims at offering the drawing processor which performs efficient object drawing processing.

[0015]

[Means for Solving the Problem] In the drawing processor which has either an alphabetic character, a graphic form or an image at least, and performs drawing processing by considering the print data described with a drawing instruction as an input in order to solve the above-mentioned technical problem in this invention A medium data generation means to generate the medium data expressed in the format which whenever [ abstract ] is higher than the DS in which a drawing output is possible, and contains at least one kind of elementary figure from said print data, Two or more expansion processing means which carry out expansion processing at drawing data with the DS in which a drawing output of said medium data is possible, A medium data distribution means to distribute based on priority whether there is any field where said medium data lap with said medium data of processing in which it does not develop to said expansion processing means from said medium data which judge and do not have the field with which it laps, The drawing processor characterized by having a drawing data storage means to memorize said drawing data, and the drawing output means which carries out the drawing output of said memorized drawing data is offered.

[0016] Here, as for a medium data generation means, whenever [ abstract ] is higher than the DS in which a drawing output is possible, and it generates the medium data expressed in the format containing at least one kind of elementary figure from print data. An expansion processing means carries out expansion processing at drawing data with the DS in which a drawing output of medium data is possible. Based on priority, it distributes whether a medium data distribution means has the field where medium data lap with the medium data of processing in which it does not develop to an expansion processing means from the medium data which judge and do not have the field with which it laps. A drawing data storage means memorizes drawing data. A drawing output means carries out the drawing output of the memorized drawing data.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 1 is principle drawing of the drawing processor of this invention. As for the medium data generation means 11, whenever [ abstract ] is higher than the DS in which a drawing output is possible, and it generates the medium data expressed in the format containing at least one kind of elementary figure from print data.

[0018] The expansion processing means 12a-12n carry out expansion processing at drawing data with the DS in which a drawing output of medium data is possible. Based on priority, it distributes whether the medium data distribution means 20 has the field where medium data lap with the medium data of processing in which it does not develop to the expansion processing means 12a-12n from the medium data which judge and do not have the field with which it laps.

[0019] The drawing data storage means 13 memorizes drawing data. The drawing output means 14 carries out the drawing output of the memorized drawing data. Next, actuation is explained. Drawing 2

is a flow chart which shows the outline operations sequence of the drawing processor of this invention.

[S1] As for the medium data generation means 11, whenever [ abstract ] is higher than the DS in which a drawing output is possible, and it generates the medium data expressed in the format containing at least one kind of elementary figure from print data.

[S2] Based on priority, it distributes whether the medium data distribution means 20 has the field where medium data lap with the medium data of processing in which it does not develop to the expansion processing means 12a-12n from the medium data which judge and do not have the field with which it laps.

[S3] The expansion processing means 12a-12n carry out expansion processing at drawing data with the DS in which a drawing output of medium data is possible.

[S4] The drawing data storage means 13 memorizes drawing data.

[S5] The drawing output means 14 carries out the drawing output of the memorized drawing data.

[0020] Drawing 3 is drawing showing the internal configuration of the medium data distribution means 20. The fetch means 21 takes out medium data from the medium data generation means 11 for every object which is the smallest unit of medium data. The object buffer 22 holds these objects. It judges whether the lap judging means 23 has the field where medium data lap with the medium data of processing in which it does not develop. The priority decision means 24 determines the priority of the object at the time of distributing medium data to the expansion processing means 12a-12n.

[0021] Next, it explains in more detail about the drawing processor of this invention. First, print data are Page Description Languages represented with PostScript. This may be a library for 3D-Graphics, such as OpenGL.

[0022] These print data are inputted into the input section (not shown in drawing.) with the application program equipped with the function to perform printing and a screen display. The medium data generation means 11 is generated from the print data into which the medium data which are DS required in order to carry out expansion processing with the expansion processing means 12a-12n were inputted.

[0023] the object which generates medium data -- the expansion processing means 12 -- it is enabling high-speed expansion processing by a-12n. Therefore, medium data are expressed with the set of a simple graphic form (for example, rectangle). The graphic form which is the minimum unit of this medium data is called an object.

[0024] The medium data distribution means 20 reads the medium data generated by the medium data generation means 11 per object, and distributes an object with the highest priority according to the demand from the expansion processing means 12a-12n.

[0025] The fetch means 21 takes out medium data from the medium data generation means 11 per object. Before the object buffer 22 distributes an object to the expansion processing means 12a-12n, it is predicted beforehand, is a buffer for holding temporarily and consists of queues with priority. It mentions later by drawing 4 for details.

[0026] The lap judging means 23 performs the lap judging with possible expansion processing to each object which predicted using the object buffer 22. That is, in drawing using an opaque model, when a lap is among objects, the object drawn newly will overwrite the already drawn object.

[0027] For this reason, it can be judged that the expansion processing by a lap with current a non-processed object being investigated in sequence before it, and there being no lap is possible for whether expansion processing of a certain object is possible.

[0028] The priority decision means 24 determines the priority of the object buffer 22 based on the result of the lap judging means 23. If expansion processing is impossible, it will be made not to output the priority of this object as 0. Such a high priority is set up that the time amount whose object of this is in the object buffer 22 is long if expansion processing is possible.

[0029] In case the medium data distribution means 20 distributes an object, even if this looks for the object in which expansion processing is possible from the head of the object buffer 22, it can acquire the same effectiveness. This invention is made to use this approach.

[0030] The expansion processing means 12a-12n develop the object outputted with the medium data distribution means 20 to reception and the bit map data which are drawing data about this. The drawing

data storage means 13 collects the bit map data generated with two or more expansion processing means 12a-12n, and holds them temporarily. In addition, with the drawing data storage means 13, since there is no lap in the field to which bit map expansion is simultaneously performed with two or more expansion processing means 12a-12n, it is not necessary to manage drawing to the drawing data storage means 13 from the expansion processing means 12a-12n using exclusive control.

[0031] Therefore, each expansion processing means 12a-12n is asynchronous, and can access the drawing data storage means 13. The drawing output means 14 receives the bit map data outputted from the drawing data storage means 13, and draws and outputs to a record form. The color page printer using the electrophotography method of the laser scanning mode which can output a full color image is mentioned by repeating exposure, development, and an imprint for every color of a CMYBK (cyanogen, Magenta, yellow, black) color as an example of the drawing output means 14.

[0032] Or the color line printer which uses an ink jet method for juxtaposition and outputs the color of a CMYBK (cyanogen, Magenta, yellow, black) color to it may be used. In addition, the drawing data storage means 13 differ in the required amount of memory according to the drawing output means 14. For example, in the case of the color line printer on which, as for the case of the color page printer using an electrophotography method, the capacity for 1 page used the ink jet method, the capacity for one line is needed.

[0033] Next, a queue with priority is explained. It is the queue to which the queue with priority outputs a value with the highest priority to the usual queue outputting the value registered in ancient times.

Drawing 4 is drawing showing the concept of a queue with priority. When F is inputted, as for the condition that, as for (B), G was inputted, and (C), H of (A) is in the condition of having been inputted.

[0034] First, in (A), the buffer is located in a line in order of A, C, E, D, and B, and presupposes that it has the priority of 6, 9, 5, 3, and 4 respectively. In addition, the larger thing of a figure makes a priority what has high priority. And suppose that F is inputted into a degree. The priority of F is 4.

[0035] In (B), highest C of a priority is outputted in a buffer and the sequence of a buffer is set to A, E, D, B, and F. 8, 7, 5, 6, and 4 reset a corresponding priority respectively. And G is inputted into a degree. The priority of G is 8.

[0036] In (C), highest A of a priority is outputted in a buffer and the sequence of a buffer is set to E, D, B, F, and G. Then, H of a priority 3 is inputted. Thus, unlike the usual queue, there is no guarantee to which what was registered in ancient times in the queue with priority is outputted. It is common to prevent raising and an old thing remaining a priority in a buffer forever as the time amount which is in a buffer becomes long actually.

[0037] Next, the medium data generation means 11 is explained. Drawing 5 is internal configuration drawing of the medium data generation means 11. Lexical-analysis means 11a is started as a token according to the syntax which was able to define the inputted print data, and outputs the token to token analysis means 11b.

[0038] Token analysis means 11b analyzes this token, changes it into an internal instruction, and is sent to instruction-execution means 11c. Instruction-execution means 11c is transmitted to 11d of image-processing means, drawing condition storage means 11e, and 11f of vector data generation means according to the instruction sent from token analysis means 11b.

[0039] 11d of image-processing means performs various kinds of image processings based on the image header and image data which were inputted, they generate an output image header and output image data, and transmit them to rectangle data control means 11j.

[0040] Drawing condition storage means 11e memorizes information required for drawing given with the instruction of instruction-execution means 11c. 11f of vector data generation means generates the vector data which should draw using the information added to an instruction and it of instruction-execution means 11c, the information from drawing condition storage means 11e, and the information from 11g of font management tools, and they transmit them to 11h of matrix conversion means.

[0041] 11g of font management tools carries out the management storage of the outline data of various fonts, and they offer outline data according to a demand. By the transformation matrix of drawing condition storage means 11e, 11h of matrix conversion means carries out affine transformation of the



vector data inputted from 11f of vector data generation means, and they transmit them to short vector generation means 11i.

[0042] Short vector generation means 11i approximates the vector to the curve in the inputted vector by the vector set (short vector) of two or more straight lines, and sends it to rectangle data generation means 11j.

[0043] Rectangle data generation means 11j generates the rectangle data which draw from the inputted short vector, adds the output image data further inputted from the color information or 11d of image-processing means inputted as the circumscription rectangle from data control information and drawing condition storage means 11e to rectangle data, and is memorized by delivery and medium data-storage means 11k to medium data-storage means 11k.

[0044] In addition, processing until medium data storage means 11k memorizes from lexical-analysis means 11a explained above is repeatedly performed, whenever a drawing instruction is inputted. Next, the judgment processing with which lap and an object judges whether expansion processing is possible with the judgment means 23 to be is explained. Drawing 6  $R > 6$  and drawing 7 are drawings showing the concept at the time of performing the lap judging of two objects.

[0045] The coordinate of  $(x1, y1, x2, y2)$ , and the circumscription rectangle of Object B is set to  $(X1, Y1, X2, Y2)$  for the coordinate of the circumscription rectangle of Object A. Here, both first two coordinate values show the coordinate at the lower left of a circumscription rectangle, and two next coordinate values show the coordinate at the upper right of a circumscription rectangle. In order for Object A to have lapped with Object B at this time, the coordinate of the point at the lower left of Object A needs to fill the following formulas.

[0046]

[Equation 1]

$$x1 \leq x2 \text{ and } y1 \leq y2 \text{ -- (1)}$$

To it and coincidence, as shown in drawing 7, the coordinate of the point at the upper right of Object A needs to fill the following formulas.

[0047]

[Equation 2]

$$x2 \geq x1 \text{ and } y2 \geq y1 \text{ -- (2)}$$

Only when both filling this formula (1) and a formula (2), it is judged with these two objects A and B having a lap. When not filling a formula (1) or a formula (2), it can judge with Objects A and B not lapping. In addition, when two objects touch here (i.e., when a borderline is equal), it judges with an overlapping thing.

[0048] Next, it laps and actuation of the judgment means 23 is explained. Drawing 8 is a flow chart which laps and shows the operations sequence of the judgment means 23.

[S10] The circumscription rectangle of the object which judges whether expansion processing is possible is set to  $(x1, y1, x2, y2)$ .

[S11] The object which judges by lapping with this object is set to a list. Specifically, the object under processing and the object located before this object in the object buffer 22 are equivalent to it with the current expansion processing means 12a-12n.

[S12] The object located in the head of the list generated at step S11 as an object which will judge from now on is set.

[S13] The circumscription rectangle of the object which will judge from now on is set to  $(X1, Y1, X2, Y2)$ .

[S14]  $x1 \leq x2$  are judged. When filling, and not filling to step S15, it goes to step S19.

[S15]  $y1 \leq y2$  are judged. When filling, and not filling to step S16, it goes to step S19.

[S16]  $x2 \geq x1$  is judged. When filling, and not filling to step S17, it goes to step S19.

[S17]  $y2 \geq y1$  is judged. When filling, and not filling to step S18, it goes to step S19.

[S18] Since all conditions are fulfilled, it judges with a lap being between objects. At this time, the lap judging means 23 sets expansion processing impossible to the status of this object of the object buffer 22.

[S19] The list generated at step S11 is investigated, and it investigates whether there is any object to which processing is not performed yet. When an object still exists, it goes to step S20, and when it does not exist, it goes to step S21.

[S20] The next object under list is set to the object which will perform a judgment from now on.

[S21] It judges with all the objects and laps under list not being found. Therefore, the lap judging means 23 sets expansion place Michiyoshi ability to the status of this object of the object buffer 22.

[0049] Next, the object buffer 22 is explained. Drawing 9 is drawing showing the configuration of the object buffer 22. In this example, the object buffer 22 takes the configuration of the queue with priority which consists of three elements.

[0050] each element of the object buffer 22 – object ID22a, status 22b, and circumscription rectangle information 22c – since – it is constituted. If the priority of each object cannot be expansion processed by status 22b, it will be 0, and a priority is a top, so that it is close to the head of a buffer, if expansion processing is possible for the status.

[0051] Next, the actuation at the time of the medium data distribution means 20 outputting an object is explained. Drawing 10 and drawing 11 R> 1 are flow charts which show the operations sequence at the time of the medium data distribution means 20 outputting an object.

[S30] The head object of the object buffer 22 is chosen.

[S31] Status 22b is checked in order with a young number to each object in the object buffer 22. If expansion processing of status 22b is impossible, it will go to step S33, and if expansion processing is possible, it will go to step S32.

[S32] The corresponding object is outputted.

[S33] It judges whether an object is in the object buffer 22. If it is, if there is nothing, it will go to step S35 to step S34.

[S34] The following object is chosen and it returns to step S31.

[S35] The head object of the object buffer 22 is chosen.

[S36] It carries out [ here or ], and even when the status of every object cannot be expansion processed, the expansion processing of either can be attained among these objects by the object which ended expansion processing now. Then, it is necessary to update status 22b of the object buffer 22, and a priority needs to output the highest object. Therefore, to each object in the object buffer 22, it laps with order with a young number, and status 22b is re-calculated using the judgment means 23.

[S37] Status 22b investigates whether expansion processing is possible. If expansion processing of status 22b is impossible, it will go to step S39, and if expansion processing is possible, it will go to step S38.

[S38] The corresponding object is outputted.

[S39] It judges whether an object is in the object buffer 22. If it is, if there is nothing, it will end to step S40.

[S40] The following object is chosen and it returns to step S36.

[0052] Here, it explains in more detail about the output of an object. When the object buffer 22 chooses one object and outputs to expansion processing means [ 12a-12n ] either, an opening occurs in the object buffer 22.

[0053] At this time, from the part which the opening generated, a back object is advanced one by one and an opening is moved to the tail end of the object buffer 22. And with the fetch means 21, a new object is added to ejection and this is added to the tail end.

[0054] Finally, the lap judging means 23 calculates status 22b to the object which status 22b in the object buffer 22 cannot expansion process, and the object newly added to the object buffer 22.

[0055] In addition, it is not necessary to perform this count to the object to which the re-calculation was already performed on the occasion of the output of an object. Next, a concrete object is shown and processing of the medium data distribution means 20 is explained. Drawing 12 is drawing showing the list of an object. Objects 101, 102, and 103 presuppose that it is the object by which current processing is carried out with the expansion processing means 12a, 12b, and 12c, respectively.

[0056] And objects 201-204 are objects located in a line with the object buffer 22 in this sequence.

Furthermore, an object 205 presupposes that it is the object read into the object buffer 22 next by the fetch means 21.

[0057] First, the lap judging means 23 generates objects 101, 102, and 103 to an object 201 as a list of objects to investigate. And it laps with each object in a list, or investigates in order. Consequently, since it becomes clear that an object 201 laps with an object 101, the lap judging means 23 presupposes that expansion processing of status 22b of an object 201 is impossible.

[0058] Next, the lap judging means 23 generates objects 101, 102, 103, and 201 to an object 202 as a list of objects to investigate. And it laps with each object in a list, or investigates in order. Consequently, since it becomes clear that an object 202 laps with no object, the lap judging means 23 enables expansion processing of status 22b of an object 202.

[0059] Similarly, to an object 203, the lap judging means 23 laps with objects 101, 102, 103, 201, and 202, or is investigated in order. Consequently, since it becomes clear that an object 203 laps with an object 101, the lap judging means 23 presupposes that expansion processing of the status of an object 203 is impossible.

[0060] Similarly, to an object 204, the lap judging means 23 laps with objects 101, 102, 103, 201, 202, and 203, or is investigated in order. Consequently, since it becomes clear that an object 204 laps with no object, the lap judging means 23 enables expansion processing of status 22b of an object 204.

[0061] Thus, the lap judging means 23 calculates status 22b to all the objects in the object buffer 22. Next, the change of state in the object buffer 22 is explained. Drawing 13 is drawing showing the change of state in the object buffer 22. The condition that the object 202 was outputted for the condition which (A) explained by drawing 12, and (B), and the object 205 has inputted, and (C) are in the condition that the object 204 was outputted.

[0062] First, suppose that processing of the object 102 in expansion processing means 12b was completed from the condition of (A). At this time, the instruction which requires a new object is transmitted to the medium data distribution means 20 from expansion processing means 12b.

[0063] The medium data distribution means 20 outputs the object 202 with the highest priority, i.e., an object, in the object buffer 22. And the new object 205 which the back object advanced one by one and was taken out from the object 202 with the fetch means 21 is added to the tail end of the object buffer 22.

[0064] Finally, the lap judging means 23 calculates status 22b to the objects 201 and 203 which status 22b in the object buffer 22 cannot expansion process, and the object 205 newly added to the object buffer 22. Consequently, the object buffer 22 comes to be shown in (B).

[0065] Next, suppose that processing of the object 101 in expansion processing means 12a was completed. At this time, the medium data distribution means 20 outputs the object 204 with the highest priority in the object buffer 22. And the lap judging means 23 re-calculates status 22b to the objects 201, 203, and 205 which status 22b in the object buffer 22 cannot expansion process. Since processing of an object 101 was completed, expansion processing of objects 201 and 203 is attained, consequently the object buffer 22 comes to be shown in (C).

[0066] These processings are repeated and all the objects in the object buffer 22 are lost, and it performs until it ends processing with all the expansion processing means 12a-12c.

[0067] As explained above, in the drawing processor of this invention, the medium data distribution means 20 investigates the lap of an object, and distributes to the expansion processing means 12a-12n based on priority from an object without a lap. For this reason, it becomes possible to process independently to each expansion processing means 12a-12n.

[0068] Moreover, whenever the expansion processing means 12a-12n end processing of an object, it becomes possible by requiring an object of the medium data distribution means 20 to measure distribution of a suitable load.

[0069] Next, the modification of the drawing processor of this invention is explained. Drawing 14 is principle drawing of the modification of a drawing processor. Here, the same sign is attached to the same configuration as drawing 1, and explanation is omitted.

[0070] Medium data generation means 11a generates medium data from the inputted print data. The

minimum unit of this medium data is an object. In the modification, the content of expansion processing of each object is further added to an object. With the content of expansion processing here, things, such as graphics processing, a character manipulation, and an image processing, are mentioned.

[0071] Medium data distribution means 20a reads the medium data generated by medium data generation means 11a per object, determines a priority dynamically based on the information on current expansion processing, and distributes an object with the highest priority.

[0072] Before the object buffer 22-1 distributes an object to the below-mentioned configuration adjustable expansion processing means 15a-15n, it is predicted beforehand, is a buffer for holding temporarily and consists of queues with priority. In the modification, the below-mentioned configuration data information is newly added as a content of expansion processing over an object as an item of the object buffer 22-1.

[0073] Priority decision means 24a determines priority to an object based on the current configuration adjustable expansion processing means [ 15a-15n ] content of expansion processing. The object which can specifically be processed from the same content of expansion processing as the content of expansion processing of the expansion processing block which the opening generated is given priority to and outputted.

[0074] The configuration adjustable expansion processing means 15a-15n reconfigure an expansion processing block for every expansion processing block according to the content of expansion processing. this — FPGA (Field Programmable Gate Array) etc. — using and realizing is possible.

[0075] Drawing 15 is drawing showing the example of an internal configuration of configuration adjustable expansion processing means 15a. In configuration adjustable expansion processing means 15a, it is possible to change the contents of processing, such as graphics processing, and an image processing, a character manipulation, per expansion processing block.

[0076] By a diagram, configuration adjustable expansion processing means 15a-1 takes three block configurations, and graphics processing and the expansion processing block C serve as [ the expansion processing block A / the image processing and the expansion processing block B ] graphics processing.

[0077] Moreover, in configuration adjustable expansion processing means 15a-2, the character manipulation and the expansion processing block C serve as [ the expansion processing block A / the image processing and the expansion processing block B ] graphics processing.

[0078] Furthermore, in configuration adjustable expansion processing means 15a-3, expansion processing block A-C serves as an image processing. Thus, the interior is divided into two or more expansion processing blocks, and configuration adjustable expansion processing means [ 15a-15n ] each can change freely the content of expansion processing processing of these expansion processing block by the object to receive.

[0079] Next, it explains in more detail about actuation of the modification which is the drawing processor of this invention. Medium data generation means 11a receives print data, and changes them into the medium data based on a rectangle. The rectangle which is the minimum unit of this medium data is an object.

[0080] In medium data generation means 11a, the content of expansion processing of an object is added to an object, and medium data are generated. The object generated by medium data generation means 11a is distributed to a certain expansion processing block in configuration adjustable expansion processing means 15a-15n by medium data distribution means 20a. First, an object is predicted by the object buffer 22-1 in medium data distribution means 20a.

[0081] The lap judging means 23 judges by lapping to each object, and distributes medium data. And it distributes to the expansion processing block with which processing of an object with the highest priority is not performed out of the predicted object, and the configuration data in which the content of expansion processing required for expansion of the object is shown are loaded.

[0082] Since an opening occurs in the object buffer 22-1 at this time, one new object is taken from medium data generation means 11a, a lap judging is performed, and a priority is set up.

[0083] And an object with the highest priority is distributed to the expansion processing block with which another processing is not performed out of these objects. Such a series of flow is continued,

expansion processing is performed with all expansion processing blocks, and medium data are distributed until the object which can be outputted from the object buffer 22-1 is lost.

[0084] In each expansion processing block, an object is received, those expansion processings are performed and it holds for the drawing data storage means 13 temporarily. Since there is no lap in the rectangle field to which processing is performed with an expansion processing block, it is possible to perform the transfer to the drawing data storage means 13 from an expansion processing block to asynchronous. And termination of expansion processing requires a new object of medium data distribution means 20a.

[0085] If medium data distribution means 20a receives the demand of a new object from an expansion processing block, based on the current content of expansion processing of an expansion processing block, priority decision means 24a will calculate the priority of each object in the object buffer 22-1, and will output an object with the highest priority.

[0086] Here, processing with an expansion processing block sets up highly the priority of the object which can be performed from the current content of expansion processing. And a new object is taken from medium data generation means 11a. And status 22b of an object is reset by lapping with the lap judging means 23 and re-calculating doubling.

[0087] in addition, what is necessary is for resetting status 22b to resemble the object which cannot be current expansion processed, and the object newly added to the object buffer 22-1, to receive, and just to perform it, since the object in which current expansion processing is possible does not become expansion processing impossible by the object added later

[0088] It investigates whether if an object is received, the current content of expansion processing of the expansion processing block which required the object, and the content of expansion processing of the configuration adjustable expansion processing means 15a-15n required for processing of an object correspond. If in agreement, allocation and processing will be performed for an object to an expansion processing block. If not in agreement, the configuration data of processing required for processing of the object are loaded, an expansion processing block is reconfigured, and processing of an object is performed.

[0089] If all objects are processed with an expansion processing block and accumulated in the drawing data storage means 13, the drawing output means 14 will draw by reading from the drawing data storage means 13 for every line according to an own recording rate (printing).

[0090] until, as for printing with the drawing output means 14, the print data for 1 page are processed – every color – or it is repeated by 4 color coincidence. Furthermore, when print data consist of two or more pages, it is repeated until the output of all pages is completed. Next, the object buffer 22-1 is explained. Drawing 16 is the block diagram of the object buffer 22-1.

[0091] The object buffer 22-1 is a queue with priority which consists of four elements. Each element of the object buffer 22-1 consists of object ID22a, status 22b, and 22d of configuration data information and circumscription rectangle information 22c.

[0092] 22d of configuration data information shows the content of expansion processing. For example, it is called graphics processing, an image processing, and a character manipulation. Next, priority decision means 24a is explained. If setting out of a priority has the demand of a new object from an expansion processing block, it will be dynamically performed based on the information on the current content of processing of the expansion processing block. First, it is a priority 0 when expansion processing of status 22b of an object is impossible. When expansion processing of status 22b of an object is possible, 22d of configuration data information of an object is investigated, and the formula shown below determines a priority.

[0093]

[Equation 3]

$C + \alpha T - (3)$

It is a priority by the block configuration, C sets a priority to 15, when the configuration data of an object are the same content of expansion processing as an expansion processing block, and when it is necessary to load the new content of expansion processing, it sets a priority to 5.

[0094] T makes a priority high, so that the time amount whose object is a priority by time amount and is in the object buffer 22-1 is long. alpha is a multiplier for adjusting the priority of T and C. Here, alpha is set up so that it may not exceed 15 whose priority by the priority + time amount when loading the new content of expansion processing is a priority when the content of expansion processing is the same. In addition, when it is in the time amount object buffer 22-1 with a long object in addition to this, setting out of alpha may be set up so that it may exceed 15.

[0095] Next, the actuation at the time of medium data distribution means 20a outputting an object is explained. Drawing 17 - drawing 18 are flow charts which show the operations sequence at the time of medium data distribution means 20a outputting an object.

[S50] The head object of the object buffer 22-1 is chosen.

[S51] Status 22b judges whether expansion processing is possible. If expansion processing is possible, if that is not right, it will go to step S54 to step S52.

[S52] It judges whether it can process by the configuration data of the released expansion processing block. If expansion processing is possible, if that is not right, it will go to step S53 to step S54.

[S53] The corresponding object is outputted.

[S54] It judges whether an object is still in the object buffer 22-1. In a certain case, if there is nothing, it will go to step S56 to step S55.

[S55] The following object is chosen.

[0096] As explained above, the flow chart of drawing 17 is searching with the same configuration data the object in which expansion processing is possible in consideration of the content of expansion processing of an expansion processing block.

[0097] Namely, what is necessary is to investigate a priority by priority decision means 24a in order with a young number, and just to output this object to each object in the object buffer 22-1, with [ a priority ] 15 [ or more ].

[0098] Moreover, if 15 or more objects have a priority, an expansion processing block can process this object, without changing the content of expansion processing. Next, the flow chart of drawing 18 is explained.

[S56] The head object of the object buffer 22-1 is chosen.

[S57] Status 22b is re-calculated.

[S58] Status 22b judges whether expansion processing is possible. If expansion processing is possible, if that is not right, it will go to step S60 to step S59.

[S59] The corresponding object is outputted.

[S60] It judges whether an object is still in the object buffer 22-1. In a certain case, if there is nothing, it will go to step S62 to step S61.

[S61] The following object is chosen.

[0099] As explained above, drawing 18 is a flow chart with which the present status 22b outputs the highest object of a priority, when there is no with a priorities of 15 or more object. What is necessary is to check status 22b in order with a young number to each object in the object buffer 22-1, to progress to the following object, if status 22b cannot be expansion processed, and just to output this object to this, if expansion processing is possible for status 22b. Next, the flow chart of drawing 19 is explained. [S62] The head object of the object buffer 22-1 is chosen.

[S63] Status 22b is re-calculated.

[S64] Status 22b judges whether expansion processing is possible. If expansion processing is possible, if that is not right, it will go to step S66 to step S65.

[S65] The corresponding object is outputted.

[S66] It judges whether an object is still in the object buffer 22-1. In a certain case, to step S67, if there is nothing, it will end.

[S67] The following object is chosen.

[0100] As explained above, drawing 19 is a flow chart with which status 22b of the object buffer 22-1 is updated, and a priority outputs the highest object. In addition, in the case where status 22b of every object cannot be expansion processed, the expansion processing of either is attained among these objects



by the object which ended expansion now.

[0101] What is necessary is to lap with order with a young number, to re-calculate status 22b to each object in the object buffer 22-1, in this, using the judgment means 23, and just to investigate to it whether the expansion processing of an object is attained.

[0102] Moreover, if status 22b cannot still be expansion processed, it will progress to the following object. This object will be outputted if the expansion processing of status 22b is attained. Since expansion processing still means that it is impossible by the object under current expansion when expansion processing of all objects is impossible, no object buffers 22-1 are outputted.

[0103] Here, it explains in more detail about the output of an object. When the object buffer 22-1 chooses one object and outputs to an expansion processing block, an opening occurs in the object buffer 22-1. At this time, from the part which the opening generated, a back object is advanced one by one and an opening is moved to the tail end of the object buffer 22-1.

[0104] And with the fetch means 21, a new object is added to ejection and this is added to the tail end. Finally, the lap judging means 23 calculates status 22b to the object which status 22b in the object buffer 22-1 cannot expansion process, and the object newly added to the object buffer 22-1.

[0105] In addition, it is not necessary to perform this count to the object to which the re-calculation was already performed on the occasion of the output of an object. Next, the configuration adjustable expansion processing means 15a-15n are explained. Drawing 20 is drawing showing the internal configuration of medium data distribution means 20a and configuration adjustable expansion processing means 15a.

[0106] The object allocation means 15-1 requires an object of medium data distribution means 20a, after processing by one of expansion processing block A-C is completed. At this time, the content information of expansion processing on expansion processing block A-C is also transmitted simultaneously. And the object will be assigned to expansion processing block A-C with a demand if an object is inputted from medium data distribution means 20a.

[0107] The reconstruction control means 15-3 manages the configuration data in which the content of expansion processing of expansion processing block A-C which consists of plurality is shown. When the object assigned to expansion processing block A-C which processing ended needs configuration data other than the configuration data of current expansion processing block A-C, the reconstruction control means 15-3 loads the configuration data to ejection and expansion processing block A-C from the configuration data storage means 15-2.

[0108] Next, a concrete object is shown and processing of medium data distribution means 20a is explained. Drawing 21 is drawing showing the list of an object. Objects 301, 302, and 303 presuppose that it is an object under current processing with the expansion processing block A in configuration adjustable expansion processing means 15a, the expansion processing block B, and the expansion processing block C, respectively. And objects 401, 402, 403, and 404 presuppose that it is the object located in a line with the object buffer 22-1 in this sequence. Furthermore, an object 405 is an object read into the object buffer 22-1 next by the fetch means 21.

[0109] Here, objects 301 and 402 are [ a graphic form object and the objects 303, 403, and 405 of an image object and objects 302, 401, and 404 ] alphabetic character objects.

[0110] First, the lap judging means 23 laps to each object of an object buffer, judges doubling, and stores the result in status 22b of the object buffer 22. Consequently, since an object 401 laps with an object 301, status 22b of an object 401 does not lap with expansion processing impossible, an object 402 does not lap with the object before it, status 22b of an object 402 laps with the expansion processing possibility of, an object 403 laps with an object 301, status 22b of an object 403 does not lap with expansion processing impossible and an object 404 does not lap with the object before it, the expansion processing of status 22b of an object 404 is attained.

[0111] Next, the change of state in the object buffer 22-1 is explained. Drawing 22 and drawing 23 are drawings showing the change of state in the object buffer 22-1. The condition that the object 404 was outputted for the condition which (A) explained by drawing 21, and (B), and the object 405 has inputted, the condition that the object 402 was outputted for (C), and (D) are in the condition that the

object 401 was outputted.

[0112] First, suppose that processing of the object 302 in the expansion processing block B was completed from the condition of (A). At this time, medium data distribution means 20a is told that the instruction which requires a new object, and the configuration data in the expansion processing block B are graphics processing from the object allocation means 15-1.

[0113] Priority decision means 24a sets a priority for configuration data being graphics processing to consideration. Although an object 401 and an object 404 are objects of graphics processing, since an object 401 cannot be expansion processed, medium data distribution means 20a outputs an object 404 as a result.

[0114] Since the object to output can process in the circuit of the expansion processing block B, it is unnecessary in loading of configuration data. And the new object 405 is added to the tail end of the ejection object buffer 22-1 with the fetch means 21.

[0115] The lap judging means 23 calculates status 22b to the objects 401 and 403 which status 22b in the object buffer 22-1 cannot expansion process, and the object 405 newly added to the object buffer 22-1. Consequently, the object buffer 22-1 comes to be shown in (B).

[0116] Next, suppose that processing of the object 303 in the expansion processing block C was completed. At this time, medium data distribution means 20a is told that the instruction which requires a new object, and the configuration data in the expansion processing block C are character manipulations from the object allocation means 15-1.

[0117] Although configuration data set a priority for it being a character manipulation to consideration, since, as for priority decision means 24a, the object which is a character manipulation and in which expansion processing is possible does not exist, medium data distribution means 20a outputs an object 402.

[0118] Since the configuration data in the expansion processing block C differ from configuration data required for processing of an object at this time, the reconstruction control means 15-3 loads the configuration data of an image processing to ejection and the expansion processing block C from the configuration data storage means 15-2.

[0119] And the lap judging means 23 calculates status 22b to the objects 401, 403, and 405 which status 22b in the object buffer 22-1 cannot expansion process. Consequently, the object buffer 22-1 comes to be shown in (C).

[0120] Next, suppose that processing of the object 301 in the expansion processing block A was completed. At this time, medium data distribution means 20a is told that the instruction which requires a new object, and the configuration data in the expansion processing block A are image processings from the object allocation means 15-1. Since there is no object which is an image processing although a priority is set to consideration and the object in which expansion processing is still more possible does not exist that configuration data are an image processing for priority decision means 24a, either, the lap judging means 23 re-calculates status 22b to the objects 401, 403, and 405 which status 22b in the object buffer 22-1 cannot expansion process.

[0121] Consequently, since the expansion processing of the object 401 which was impossible for expansion processing is attained by the object 301 until now, medium data distribution means 20a outputs an object 401. Since the configuration data in the expansion processing block A differ from configuration data required for processing of an object at this time, the reconstruction control means 15-3 loads the configuration data of graphics processing to ejection and the expansion processing block A from the configuration data storage means 15-2. Consequently, the object buffer 22-1 comes to be shown in (D).

[0122] These processings are repeated and all the objects of the object buffer 22-1 are lost, and it performs until it ends processing with all expansion processing blocks. As explained above, the modification of the drawing processor of this invention investigates the lap of an object. And it is an object without a lap and considered as the configuration which gives priority to the object in which the same processing as the content of expansion processing of an expansion processing block is possible, and is distributed to an expansion processing block.



[0123] While being able to perform independently processing with each configuration adjustable expansion processing means 15a-15n by this, it becomes possible to reduce rewriting of the configuration data in which the content of expansion processing of an expansion processing block is shown.

[0124] Moreover, whenever an expansion processing block ends processing of an object, it becomes possible by requiring an object of medium data distribution means 20a to measure distribution of a suitable load.

[0125]

[Effect of the Invention] As explained above, the drawing processor of this invention was considered as the configuration which carries out expansion processing of the lap of medium data based on priority from the medium data which judge and do not have the field with which it laps, and draws. Since medium data can be assigned one by one by this to the expansion processing means which has more than one, without mistaking the up Shimonoseki charge of a lap, it becomes possible to perform efficient drawing processing.

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[Translation done.]

**\* NOTICES \***

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is principle drawing of the drawing processor of this invention.

[Drawing 2] It is the flow chart which shows the outline operations sequence of the drawing processor of this invention.

[Drawing 3] It is drawing showing the internal configuration of a medium data distribution means.

[Drawing 4] It is drawing showing the concept of a queue with priority. As for the condition that F was inputted, the condition that, as for (B), G was inputted, and (C), H of (A) is in the condition of having been inputted.

[Drawing 5] It is internal configuration drawing of a medium data generation means.

[Drawing 6] It is drawing showing the concept at the time of performing the lap judging of two objects.

[Drawing 7] It is drawing showing the concept at the time of performing the lap judging of two objects.

[Drawing 8] It is the flow chart which shows the operations sequence of a lap judging means.

[Drawing 9] It is drawing showing the configuration of an object buffer.

[Drawing 10] It is the flow chart which shows the operations sequence at the time of a medium data distribution means outputting an object.

[Drawing 11] It is the flow chart which shows the operations sequence at the time of a medium data distribution means outputting an object.

[Drawing 12] It is drawing showing the list of an object.

[Drawing 13] It is drawing showing the change of state in an object buffer. The condition that the object 202 was outputted and the object 205 has inputted the condition which explained (A) by drawing 12, and (B), and (C) are in the condition that the object 204 was outputted.

[Drawing 14] It is principle drawing of the modification of a drawing processor.

[Drawing 15] It is drawing showing the example of an internal configuration of a configuration adjustable expansion processing means.

[Drawing 16] It is the block diagram of an object.

[Drawing 17] It is the flow chart which shows the operations sequence at the time of a medium data distribution means outputting an object.

[Drawing 18] It is the flow chart which shows the operations sequence at the time of a medium data distribution means outputting an object.

[Drawing 19] It is the flow chart which shows the operations sequence at the time of a medium data distribution means outputting an object.

[Drawing 20] It is drawing showing the internal configuration of a medium data distribution means and a configuration adjustable expansion processing means.

[Drawing 21] It is drawing showing the list of an object.

[Drawing 22] It is drawing showing the change of state in an object buffer. The condition which explained (A) by drawing 21, and (B) are in the condition that the object 404 was outputted and the object 405 has inputted.

[Drawing 23] It is drawing showing the change of state in an object buffer. As for the condition that the

object 402 was outputted, and (D), the object 401 of (C) is in the outputted condition.

[Description of Notations]

11 Medium Data Generation Means

12a-12n Expansion processing means

13 Drawing Data Storage Means

14 Drawing Output Means

20 Medium Data Distribution Means

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[Translation done.]

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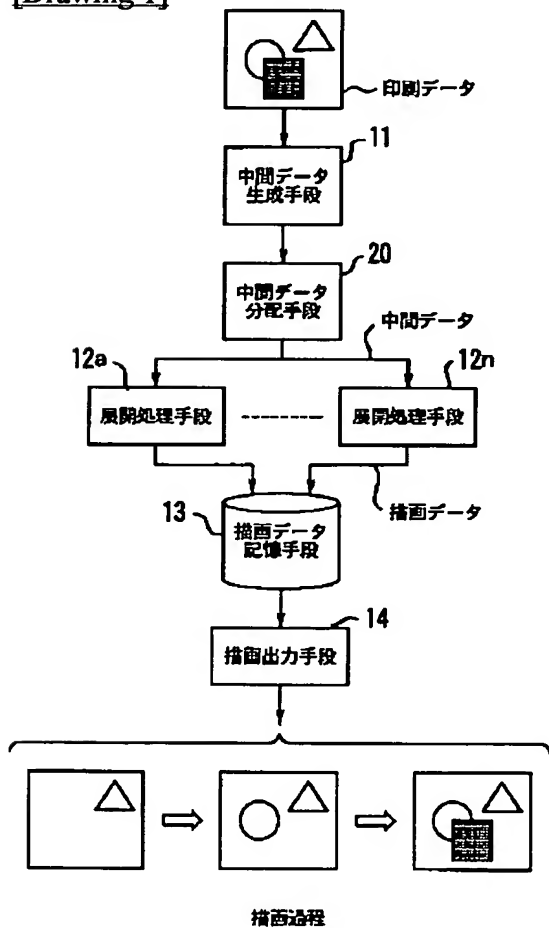
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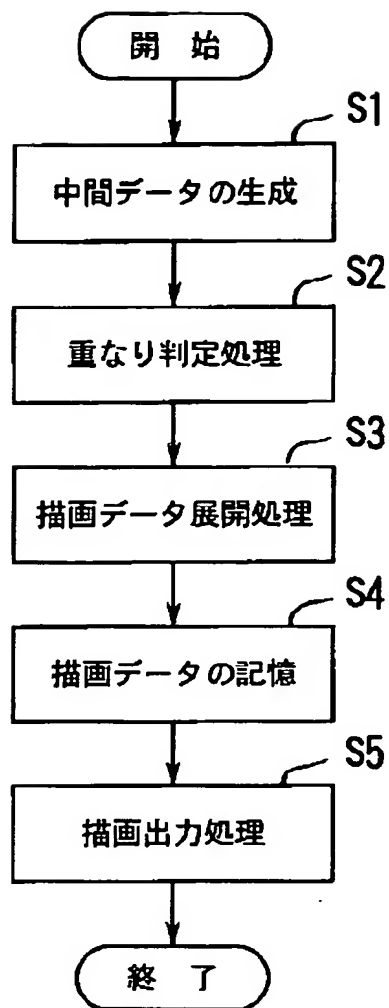
**DRAWINGS**

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[Drawing 1]

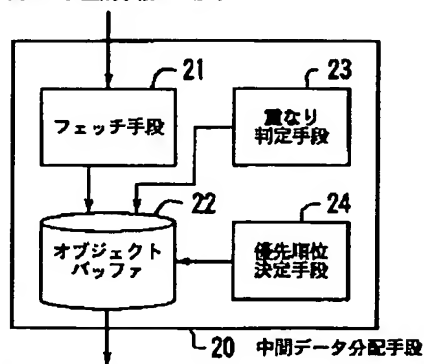


[Drawing 2]



[Drawing 3]

中間データ生成手段11から



展開処理手段12a~12nへ

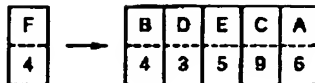
[Drawing 9]

22a オブジェクトID      22b ステータス      22c 外接矩形情報

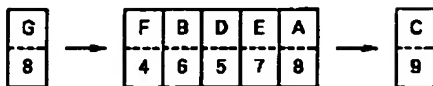
201	展開処理不能	(20、180、40、180)
202	展開処理可能	(150、40、180、50)
203	展開処理不能	(60、45、70、180)
204	展開処理可能	(140、180、170、175)

[Drawing 4]

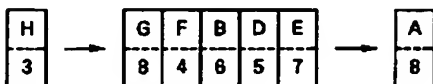
(A)



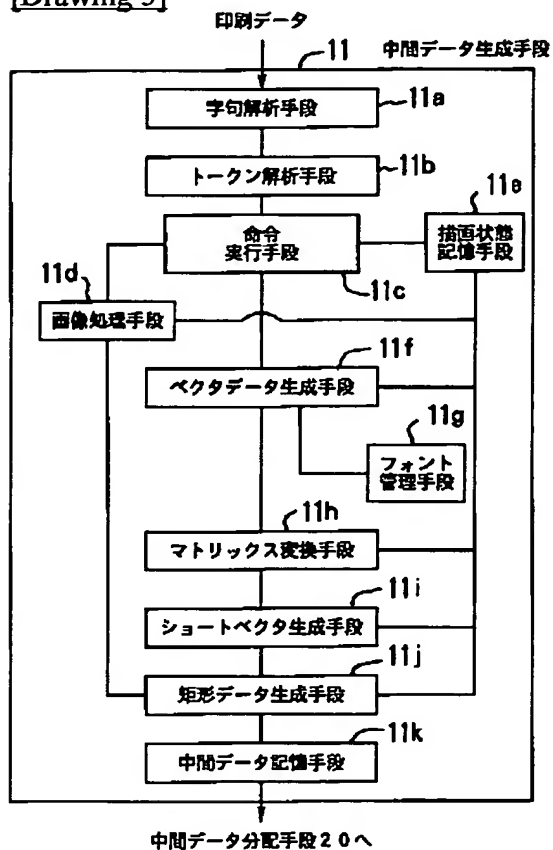
(B)



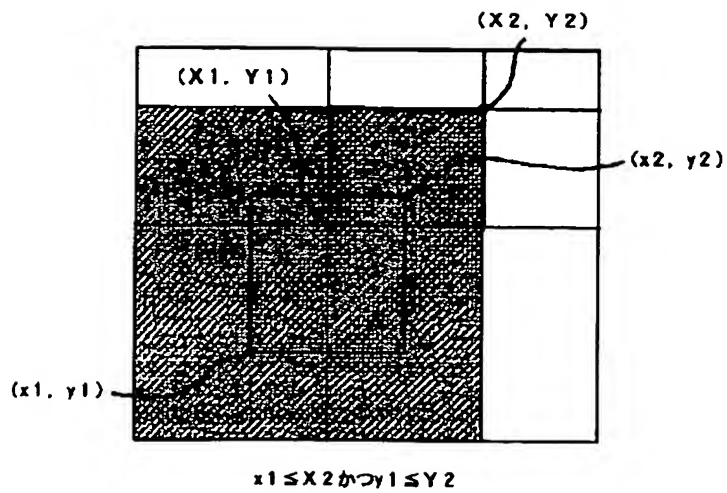
(C)



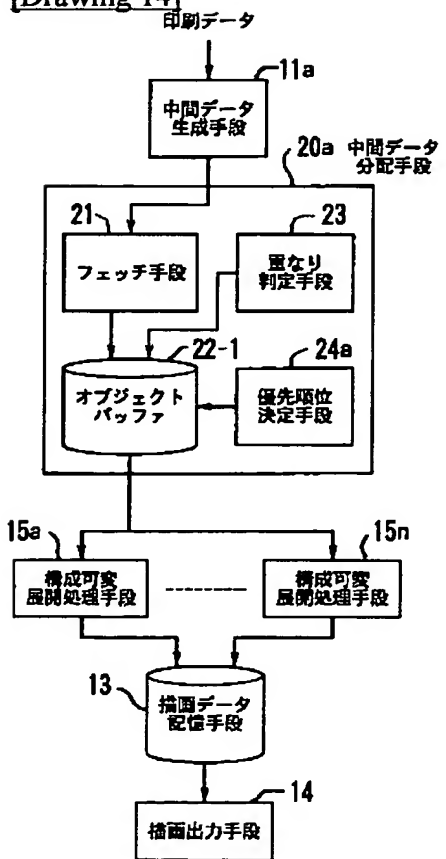
[Drawing 5]



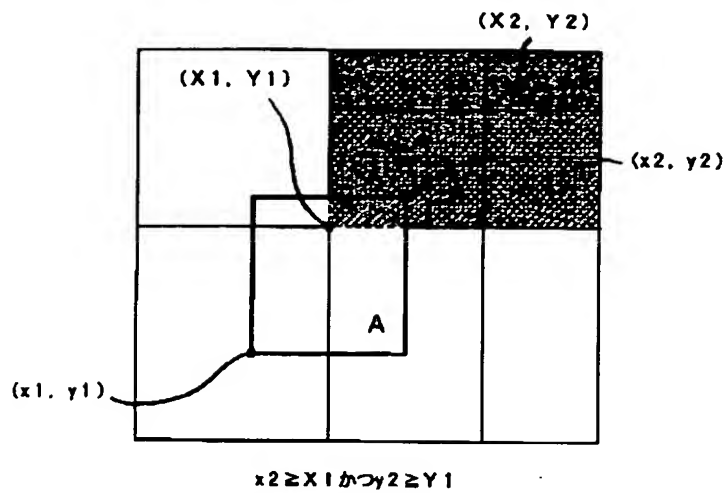
[Drawing 6]



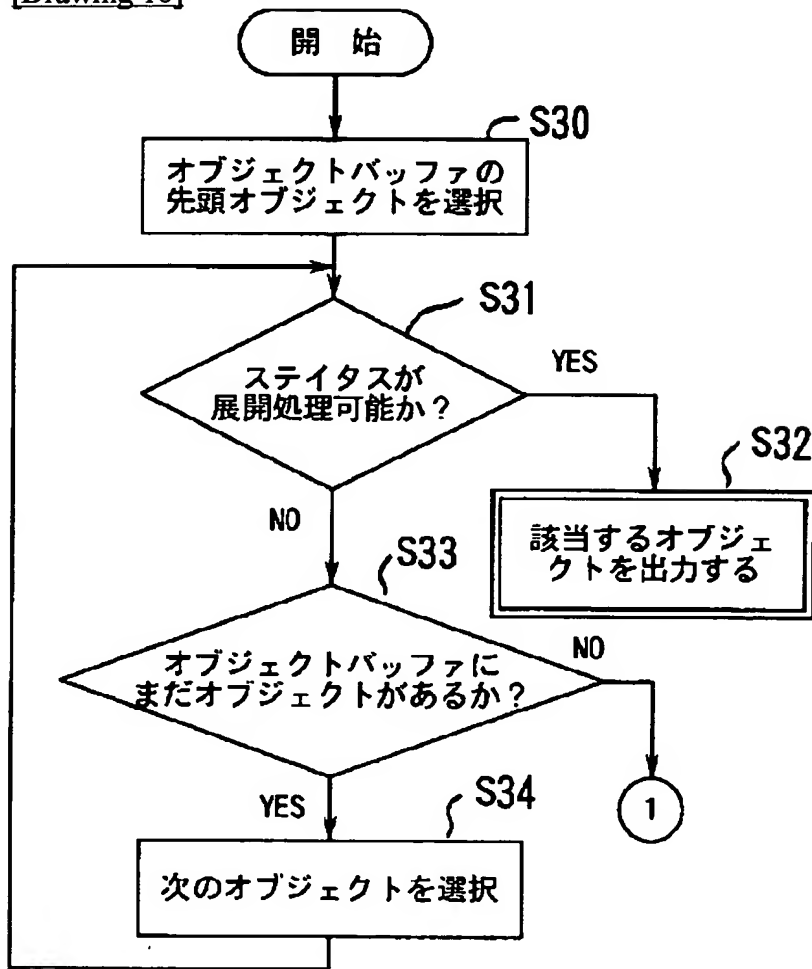
[Drawing 14]



[Drawing 7]

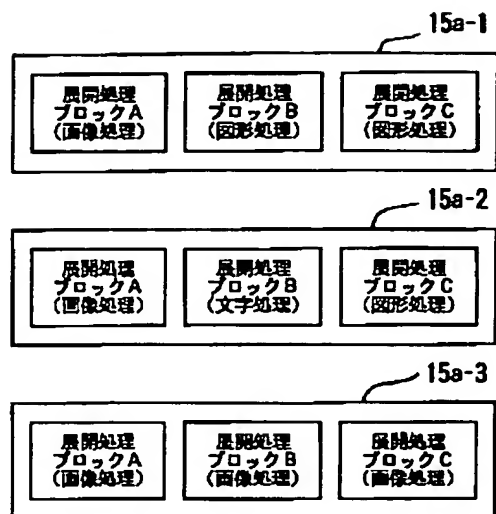


[Drawing 10]

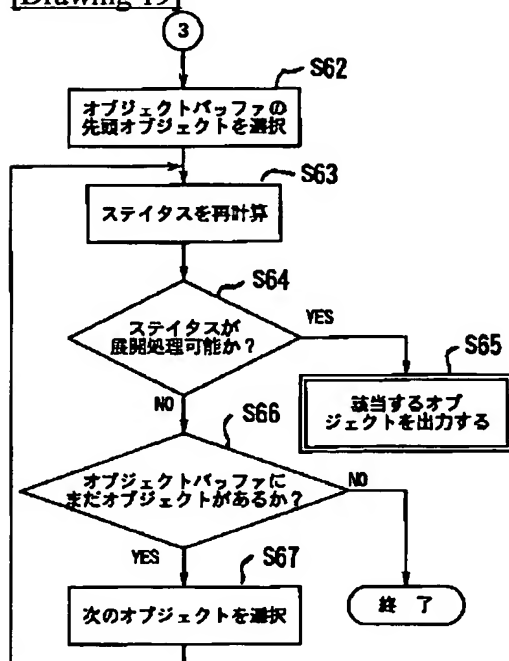


[Drawing 15]

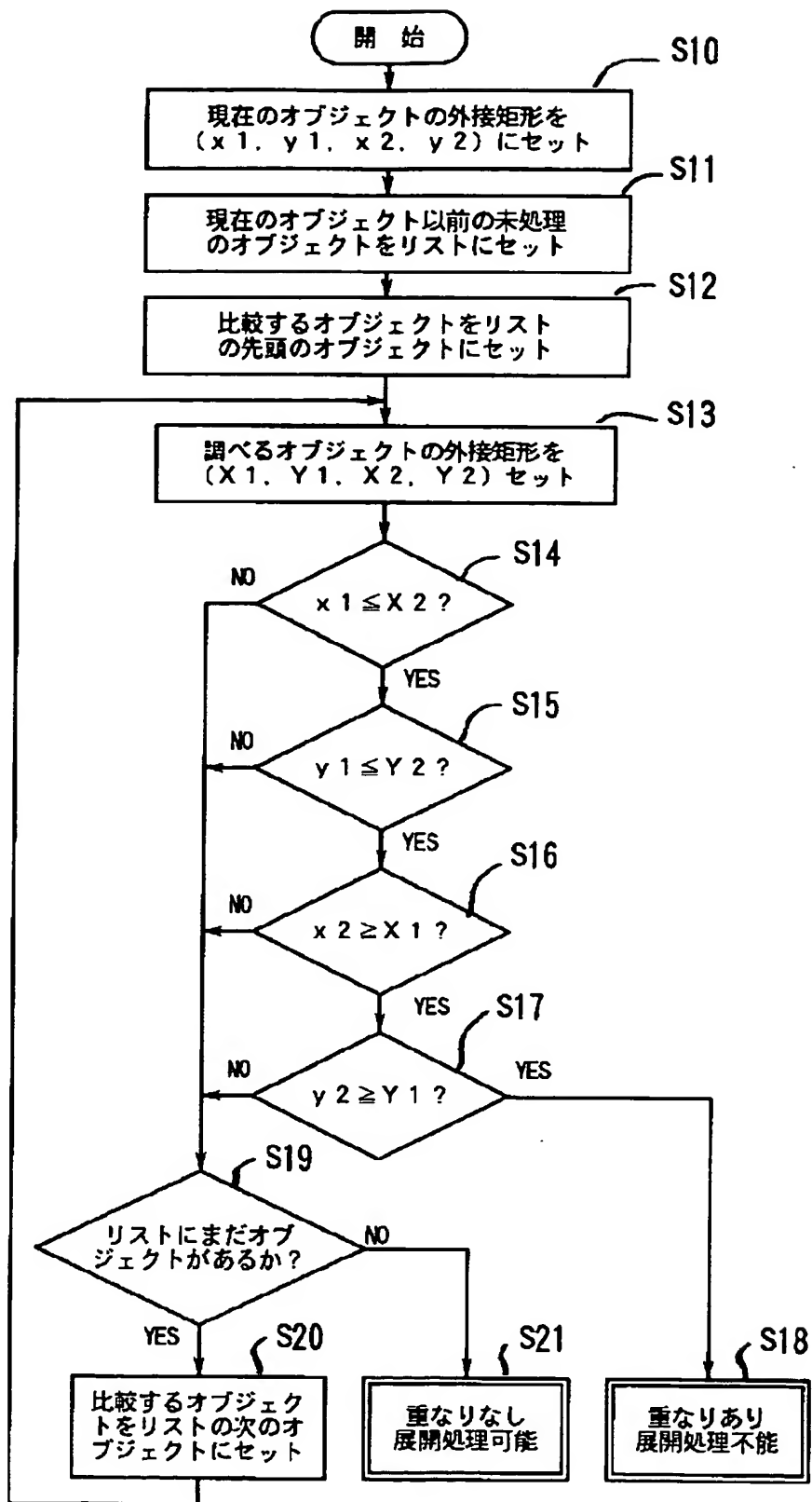




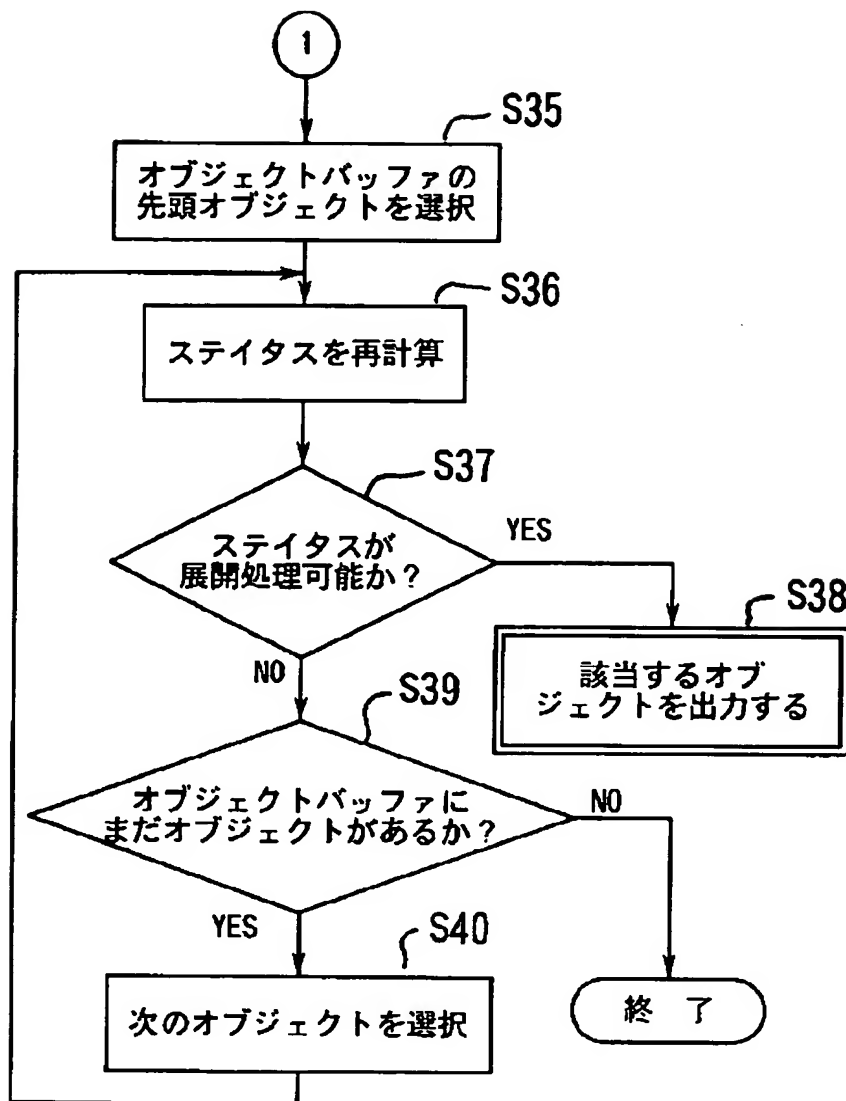
[Drawing 19]



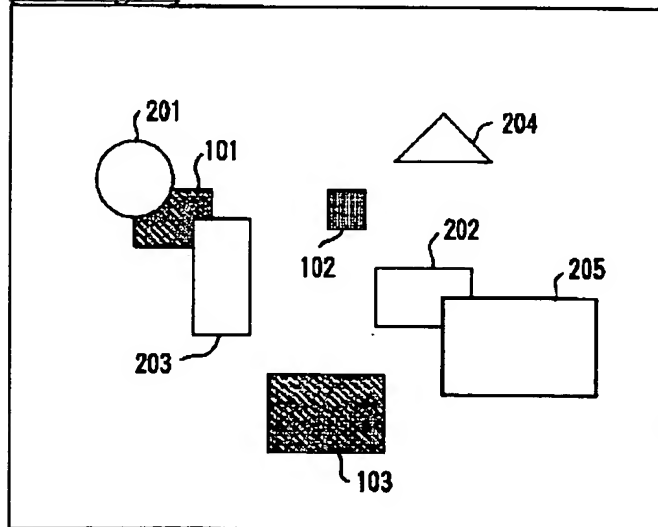
[Drawing 8]



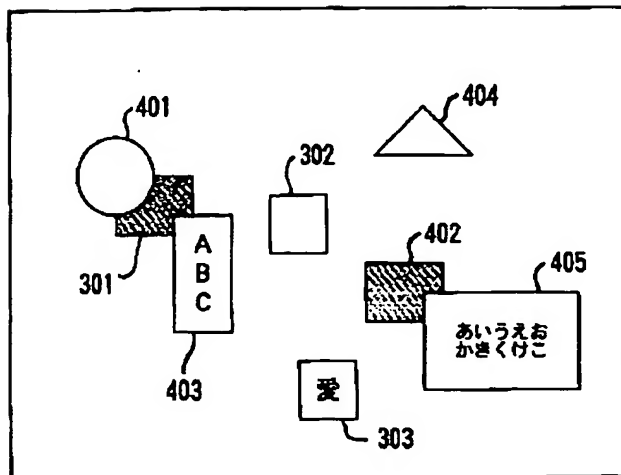
[Drawing 11]



[Drawing 12]



[Drawing 21]



[Drawing 13]  
(A)

201	展開処理不能	(20、160、40、180)
202	展開処理可能	(150、40、180、50)
203	展開処理不能	(60、45、70、160)
204	展開処理可能	(140、160、170、175)

(B)

201	展開処理不能	(20、160、40、180)
203	展開処理不能	(60、45、70、160)
204	展開処理可能	(140、160、170、175)
205	展開処理不能	(155、20、180、45)

(C)

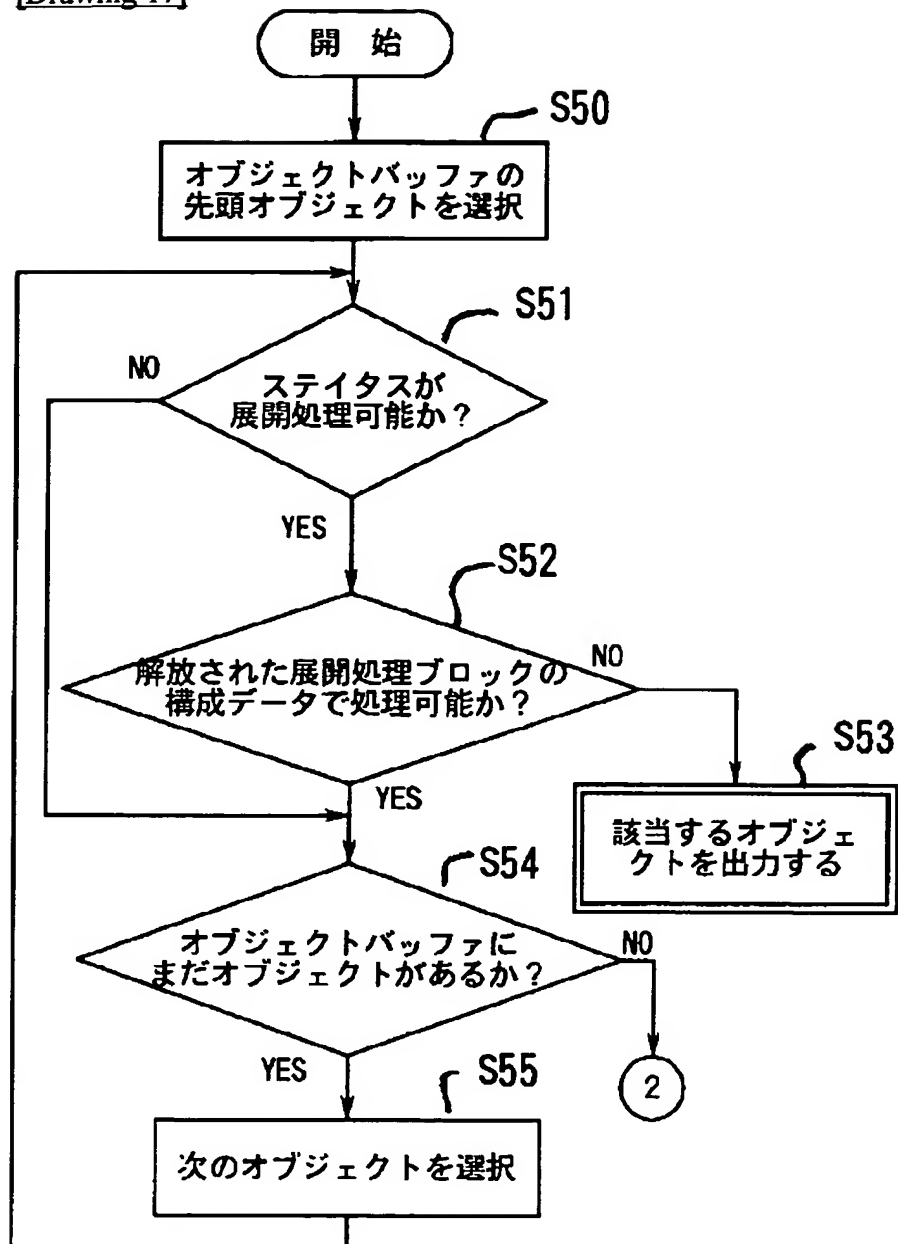
201	展開処理可能	(20、160、40、180)
203	展開処理可能	(60、45、70、160)
205	展開処理不能	(155、20、180、45)

[Drawing 16]

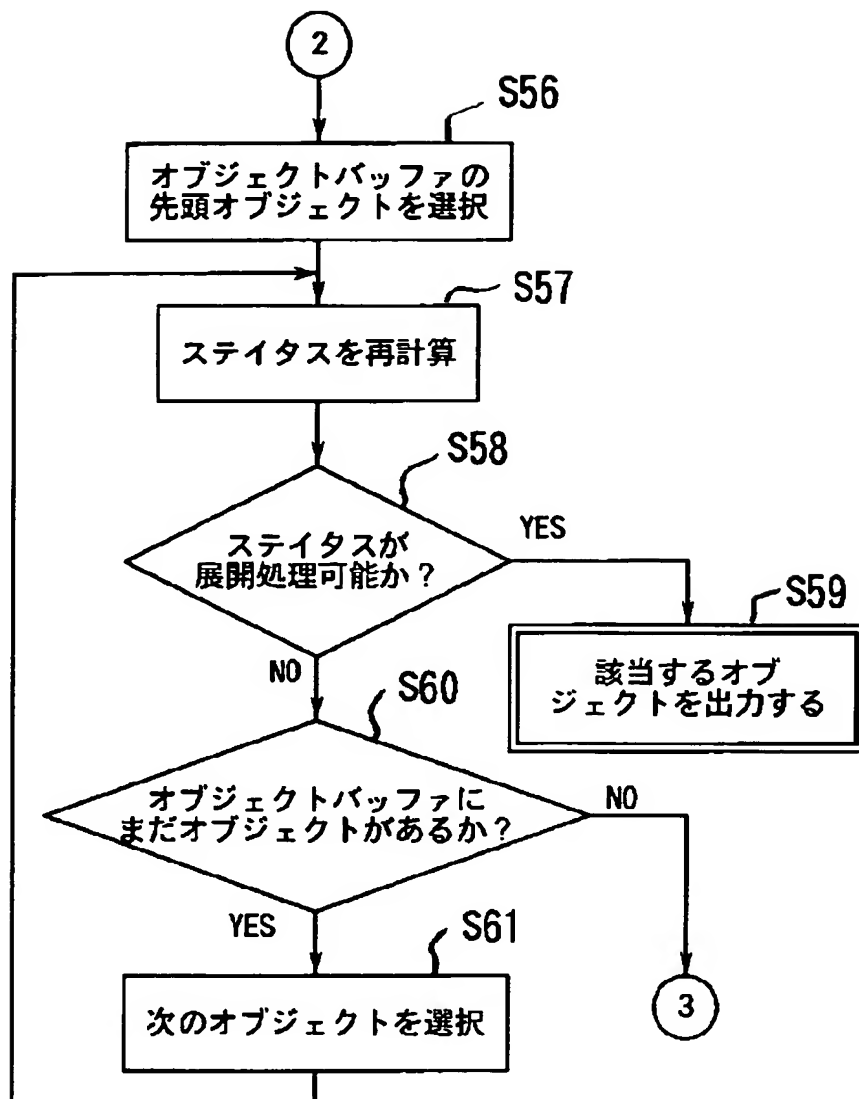
22a		22b		22d 構成データ情報		22c
401	展開処理不能	図形処理	(20、160、40、180)			
402	展開処理可能	画像処理	(150、40、180、50)			
403	展開処理不能	画像処理	(60、45、70、160)			
404	展開処理可能	文字処理	(140、160、170、175)			

22-1

[Drawing 17]



[Drawing 18]



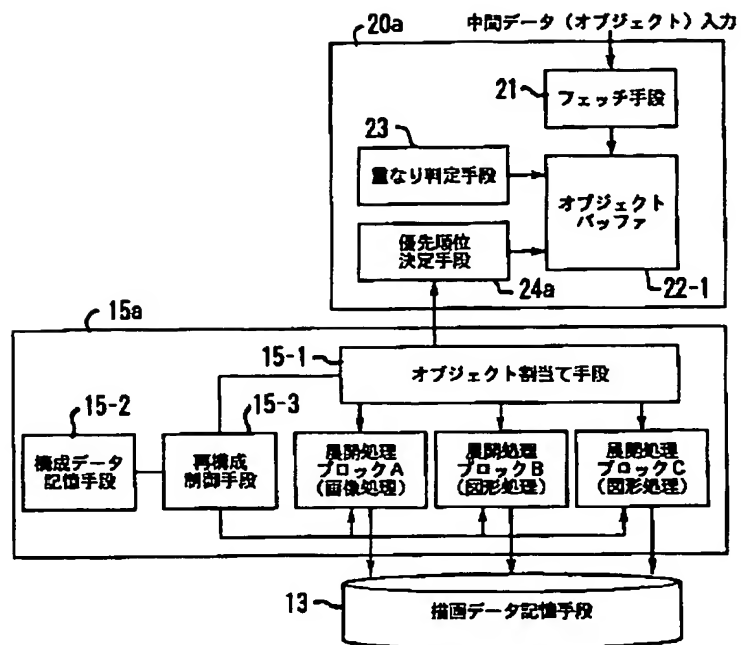
[Drawing 22]  
(A)

401	展開処理不能	図形処理	(20、160、40、180)
402	展開処理可能	画像処理	(150、40、160、50)
403	展開処理不能	文字処理	(60、45、70、180)
404	展開処理可能	図形処理	(140、160、170、175)

(B)

401	展開処理不能	図形処理	(20、160、40、180)
402	展開処理可能	画像処理	(150、40、160、50)
403	展開処理不能	文字処理	(60、45、70、160)
405	展開処理不能	文字処理	(155、20、180、45)

[Drawing 20]



[Drawing 23]  
(c)

401	展開処理不能	図形処理	(20、180、40、180)
403	展開処理不能	文字処理	(60、45、70、160)
405	展開処理不能	文字処理	(155、20、180、45)

(D)

403	展開処理可能	文字処理	(60、45、70、160)
405	展開処理不能	文字処理	(155、20、180、45)

[Translation done.]